

APPENDICES

Appendix 1: Guidelines Associated with Navigable Waterways in the State of Michigan

1. Basic Description

The public can use streams capable of floating commercial logs at seasonal high flows. Rivers that are navigable at times of spring high flows are navigable all year. Although the public has the right to wade and fish in navigable streams, there is some question as to whether the law protects the right to recreationally boat on navigable rivers.

2. State Test of Navigability

In Michigan, "strictly navigable streams" are rivers that satisfy the federal commerce test for navigability- they are navigable in fact by large vessels engaged in commerce. As in all federally navigable streams, the public right of navigation in these waters is paramount to the riparian rights of private owners. Smaller inland streams are also subject to the public trust doctrine in Michigan if they satisfy the commercial log-floating test of navigability. Michigan expressly chose not to adopt the recreational boating test as its state test of navigability. The application of the log-floating test is ad hoc, and navigability may be demonstrated or assumed where records indicate use for commercial log floating or where other streams of comparable size have been declared navigable under the commercial log-floating test. Navigability under this test has been found where spring freshets occur that are capable of floating logs. Although the freshets are seasonal, the public trust applies all year. However, a river can become non-navigable over time. In addition, the fact that the public uses a river for a long period of time can be an important factor in favor of allowing public use in close cases.

3. Extent of Public Rights in Navigable Rivers

Persons on inland navigable waters (navigable under the state test) do not have the same rights as riparian owners. Apart from the Great Lakes, riparians, not the state, own the bed to the thread of the river. Nevertheless, fishing and wading were recognized in the Bott decision as a recreational use incident to the navigational servitude over inland navigable waterways. Oddly, the Bott court expressly reserved the question as to whether recreational boating is a use protected by the navigation servitude as well (the court noted that fisherman are quiet and unobtrusive as compared the nuisance like behavior of recreational boaters).

The navigation servitude extends to the ordinary high water mark. Streams deemed non-navigable by the log-floating test are private, and riparian owners have the right to exclude members of the public, even if there is a navigable means of access.

4. Statutes Governing Landowner Liability

Michigan's recreational use statute (Mich. Comp. Laws. Ann. § 300.201) was passed in 1953. This law does not specify whether the landowner has a duty to keep the property safe, warn of hazardous conditions, or provide any assurances of safety. In general, this law grants landowners broad immunity from liability for personal injuries or property damage suffered by recreators on the owner's land. However, the law does not protect the landowner from liability for willful or wanton misconduct, and does not protect the landowner if a fee is charged for the use of the property, though a landowner may charge a fee for "U-Pick" crops and not lose immunity. Michigan's tort claims act, which defines the scope of the government's liability, is detailed in Mich. Comp. Laws §§ 691.1401 - 691.1415.

5. Miscellaneous

Willful trespass after receiving notice to depart is a misdemeanor with a fine of up to 50 dollars and jail sentence up to 30 days.

Appendix 2: Information and Education Strategy

One of the three major goals of the Rabbit River Watershed Project is to reduce non-point source pollution by increasing knowledge and awareness of water quality and watershed issues through information and education including encouraging and maintaining a high level of stakeholder participation. Stakeholder knowledge and awareness will lead to improved stewardship of the watershed. The Rabbit River Watershed project demonstrates a high level of stakeholder involvement and utilizes momentum generated by other water quality initiatives in the area. The Rabbit River Watershed Clean Water Action Plan Project, and the Upper Rabbit River Watershed Planning Project have established and maintained a framework of positive community involvement to improve and protect water resources. The projects have developed widespread support for water quality projects both in and out of the watersheds. Local community leaders, watershed residents and landowners continue to become involved, and express their concerns about water quality and land-use practices that affect it. For more detailed information on specific tasks, partners, products and estimated costs and sources, see the Rabbit River Watershed Action Plan: [Table 9 Action Plan](#).

Information and Education Strategies:

Objective: Provide information about watersheds, water quality, and natural resources.

Effective educational programs and distribution of educational materials can reach a wide audience. The Rabbit River Watershed's Information and Education program has three main audiences: the general public and watershed residents; local producers, farmers or landowners; and the educational community (students, teachers, and other educators.)

Action: Serve as a clearinghouse of existing information. Compile and distribute natural resources information as tools for land-use planning on the Rabbit River Watershed, including Natural Features Inventory data, soils, pre-settlement vegetation, floodplains, wetlands, and other data. The data will be used to develop appropriate tools for planners/local officials to use when creating land-use ordinances.

Partners: ACD, Watershed coordinator, Allegan County Geographic Information Systems, other organizations

Products: Land-use planning tools for local planners and townships to use to protect water quality (computer databases, maps, reports, papers, sample ordinances)

Action: Work Product Sustainability/Accessibility: Ensure a high level of accessibility to information and maintain project sustainability.

Tasks: Make information readily available to public. Update information regularly, to maintain accuracy and relevance

Partners: ACD/Watershed Coordinator

Products: Information in a useable, day-to-day accessible form (For townships with computer access, this may be electronic or web based.)

Objective: Increase public awareness of watershed and water quality issues.

Action: Implement communication strategies to reduce nonpoint source pollution.

Tasks: Develop and distribute educational materials (brochure, fact sheets, radio spots, coloring book, etc.) to increase stakeholder awareness of water quality issues in the watershed. Publicize agricultural and residential BMPs. Develop highly visible demonstration sites for BMPs within context targeting further landowners.

Partners: Watershed Coordinator

Products: Educational materials (brochure, fact sheets, coloring book), increased awareness (radio spots, Public Service Announcements), highly visible BMPs as demonstration sites

Action: Newsletter: Develop and distribute the quarterly "Rabbit River Hoppenings" Newsletter

Tasks: Write and/or collect and edit articles. Manage mailing lists. Distribute newsletter quarterly.

Partners: Watershed Coordinator, ACD

Products: Quarterly newsletter

Action: Conduct and participate in joint educational events

Tasks: Organize workshop with and for townships, riparian landowners, or other interested groups. Work with Math Science Center and educators on area events such as Eco-Expo, Envirothon. Organize and conduct monthly steering committee meetings.

Partners: ACD, Watershed Coordinator, Allegan Math and Science Center

Products: Workshops, training and other events, and increased awareness of watershed and water quality issues

Action: Rabbit River Watershed Student Stream Science Program The Student Stream Science Program began in the fall of 2000 with a teacher training to get Allegan Area educators involved in macroinvertebrate sampling. Since then, more than 7 school districts and over 200 students have participated. [See [Appendix 6a Student Stream Science Newsletter](#)]

Tasks: Recruit and train interested educators and community members. Choose and sample at specific sites around the watershed. Coordinate teacher/student groups, equipment and data collection. Compile data, photos, samples and maintain in database. Assist students with data interpretation and presentation. Maintain samples as a teaching collection. Design and maintain website about Rabbit River Watershed Project and Stream Science program. Include photos, macroinvertebrate data and analyses, and water quality data. Distribute as a teaching/education tool. Include project updates and information.

Partners: Watershed Coordinator, Allegan Math and Science Center, educators and students

Products: Educators, administrators, and community members involved in watershed science. Macroinvertebrate and land-use/stream condition data from the watershed. Collaboration with DEQ, Macroinvertebrate teaching collection. Database of stream and macroinvertebrate data. Website with data, project info, photos, etc. (Website will be maintained by Math and Science Center)



Rabbit River Watershed Educational Display. Appropriate for a variety of venues including the Allegan County Fair, School Career Days, Steering Committee Meetings and other presentations.

The targeted audiences of the Rabbit River Watershed Project include landowners, especially farmers and producers, local (especially township and county level) governments, agencies, and planning commissions, watershed residents and the general public, and students in the watershed, especially the secondary education community. Each targeted audience impacts water quality and non-point source pollution in a different way. Most immediately, landowners and producers have control over their land. Information dispersal leads to implementation of BMPS to prevent NPS pollution. Educational opportunities include FSA newsletters, farm radio spots, Rabbit River Hoppenings Newsletter, brochures and fact sheets at Farm Bureau, farm shows, and the Allegan County Fair.

Local agencies have a more far-reaching influence, but a much less immediate one. Information and Education, Workshops, seminars, and other activities will provide townships, planning commissions, and agencies with the tools to prevent and fix NPS pollution with zoning ordinances, land-use planning, improved drain or road maintenance projects, and so on. Educational opportunities include township meetings, workshops and/or seminars, publications, etc.

Watershed residents, especially riparian landowners, have another source of immediate control over NPS source pollution. Other watershed residents act as word-of mouth conduits, will have important impacts on future projects, and will foster high-stakeholder involvement. Issues such as storm drains, riparian vegetation, composting, etc. will be more influential than their immediate span may indicate. Educational opportunities include the Rabbit River Newsletter, the Allegan County Fair, local newspapers, information at Allegan Conservation District. Library display: traveling display will informational brochures, handouts, etc. fact sheets, that moves from local library to library in the watershed, or if funds allow, one for each library in the watershed.

One specific way the Rabbit River Watershed Project will try to reach the general public is by maintaining and collecting available information. The Allegan Conservation District, by serving as a clearinghouse of information, will have a variety of natural resources related information available in one place. The Rabbit River Watershed Project can periodically advertise, through newsletters, by local news media, or through other outlets. It may also gather and disseminate relevant and available information to township and city officials, planning commissions, and other planners for use as tools for planning and zoning. Information must be readily available and useable on a day to day basis for land-use and planning decisions.

Another of the target audiences of the Rabbit River Watershed is the student in the watershed. The Rabbit River Watershed includes parts of seven different school districts, but in area is dominated by three: Hopkins, Wayland, and Hamilton. Sample activities include school programs, assemblies, and bulletin boards or displays in the schools. Outreach to students is planning for the future: students are the future influences of our watershed, and will be the ones who decide the course of water quality. Our targeted student audience includes kindergarten through 12th grade. School programs range from an EnviroScape presentation and watershed activities for first graders, to teaching a class about erosion, and having them design a system of Best Management Practices to prevent erosion on several example sites. Encourage adoption of watershed, and non-point source pollution-related curricula in area schools.

One major educational program is the Student Stream Science Program. For more information on this program, see [Appendix 6a: Student Stream Science Program Newsletter](#).

The ENVIROSCAPE: An interactive watershed model



Presenting the ENVIROSCAPE, an interactive watershed model used in science and environmental curricula across the country to Ms. Koops First Grade in Burnips, MI.

The EnviroScape is an interactive watershed model that is used in science classes and for environmental programs across the country. Students learn about watersheds, erosion, pollution, and how people's activities affect water quality. The model is molded plastic, and has areas of uplands, wetlands, and surface water. Students first "build" their watershed, placing houses, industry, farms, forest, wetlands, etc. on the model. Then, depending on the selected lesson, sediment or pollutants may be introduced to the system (using colored drink mix powder, instant coffee, or cinnamon). Students make it "rain" using squirt bottles, and then observe what happens to sediment and pollutants as they run downstream. The effect of wetlands placed on the model (symbolized by sponges) can be a very dramatic and effective lesson. Other uses of the model include groundwater and land-use education.

APPENDIX 3: Land-Use Planning Survey

January 31, 2001

Re: Natural Resource Friendly Planning and Zoning Workshop

Dear Supervisors, Planners, and others interested in Land-Use Issues:

Greetings!

Land use planning is one the most important issues facing many local governments, planning commissions and residents of Allegan County. Suburban sprawl, loss of farmland and open space, and degraded water quality are all issues that we must confront now and in the years to come.

The Rabbit River Watershed Project is dedicated to improving water quality and aquatic habitat in the Rabbit River Watershed by decreasing non-point source pollution, including sediment, nutrients, and run-off. Many of the land-use issues that are affecting Allegan County right now have an adverse effect on water quality. Increasing amounts of imperious surfaces, like rooftops, parking lots and other paved areas all provide increased flow to surface water systems, in addition to contributing to erosion and sediment. Losses of streamside vegetation, riparian buffers and wetlands all have negative effects on water quality and aquatic habitat.

Natural resource friendly planning and zoning is an effective way to help increase and maintain standards of water quality. Clustered developments, detention and retention ponds, porous paving, open space easements and public green spaces are all innovative and exciting methods for natural resource friendly planning.

The Rabbit River Watershed Project is interested in presenting information in the form of a workshop or seminar to those members of the community who are interested. Possible audiences will include township supervisors, and other board members, city, township and county planners, local land trusts, concerned citizens, lake associations, local environmental groups, and many more. Please take a few brief moments to fill out and return the enclosed survey. This survey will help us to better understand what the community's needs and wants are in regard to land use planning and zoning. We look forward to hearing from you!

Sincerely,

Michelle J. Huffman
Watershed Coordinator

Enclosure (1)

Natural Resource Friendly Land Use Planning and Zoning Survey

Name: _____

Title: _____

Organization: _____

Phone: _____ E-mail: _____

Address: _____

1. Please check all subjects or issues that are of interest to you:

☐ Clustered Development/ Compact Livable Communities

☐ Stormwater Management/Impervious Surfaces

☐ Suburban Sprawl

☐ Loss of farmland/open space

☐ Conservation Zoning and Sample Ordinances

☐ Agricultural/Residential interface

☐ Purchase of Development Rights/Conservation Easements

☐ Other: _____

2. The biggest issue related to land use in Allegan County is: _____

3. What land-use, planning, or zoning issues would be most applicable or helpful, or what would you most like to learn about?

4. My other interests in the field of land-use planning include:

—

5. I would be most able to attend a workshop (please circle choices):

Winter, Spring, Summer, Fall

Weekday Morning, Weekday Afternoon, Weekday Evening, Saturday

I am not interested in a land-use workshop at this time, but would like to receive

information about any future events: ☐

Results from Land-Use Planning Survey:

Total sent out: 52

Total returned: 20

Percent return rate: 38%

1. Please check all subjects interested:

Cluster Development/Compact Livable Communities	6
Stormwater Management/Impervious Surfaces	7
Suburban Sprawl	11
Loss of farmland/open space	10
Conservation Zoning and Sample Ordinances	7
Agricultural/Residential Interface	6
Purchase of Development Rights/Conservation Easements	9

2. The biggest issue related to land use in Allegan County is: *Loss of farmland and open space, Increased development, increased flooding potential, Lack of concern for those being flooded, Stormwater management, Zoning, Balanced Development, Aesthetic and environmental impacts of developments with no sewer and water systems, Loss of farmland, Increased impervious surfaces, Loss of open space and habitat.*

3. Land-use planning or zoning issues would be most applicable of helpful, or what would you most like to learn about? *Conservation zoning and clustered development, Education for planners as to stormwater management, the new GAAMP rules, BMPs to reduce sedimentation and erosion, Local private road standards, Rapid, unplanned, unregulated, unmindful of the environment growth, R-2 development without sewer and water, Environmental impact of homes and septic/well close together.*

4. My other interests in the field of land-use planning include: *Identification and ordinances pertaining to floodplain protection, Transportation, Sample Ordinances that have been proven effective and enforceable for all of the issues listed in #1 above, Sewer developments around inland lakes.*

I am not interested in a land-use workshop at this time: 4

Public Meeting

JANUARY 29, 2002

(Results in italics)

Appendix 3a: Watershed Meeting Survey and Comments

General Information:

1. Do you live in the Rabbit River Watershed? **YES(14)**

NO(2)

2. Do you live or own land adjacent to surface water? **YES(10)**

NO(5)

Type (stream(0), creek(1), lake(2), drain(3), river(5)) and name, if known?

Miller Creek, Bear Swamp Drain, East Lake (2), Rabbit River (5)

3. How many acres do you own? (Please circle one)

<1 acre 1-5 acres 6-10 acres 10-20 acres 20-50 acres >50

acres

(3) (4) (1) (2) (0) (5)

4. What recreational activities do you or your family practice in the Rabbit River? (Please circle

all which apply) **Fish Canoe Swim Hike Other** *Recreation, None,*

(8) (4) (2) (5) Cleaning the River

Watershed Management Plan:

5. The Rabbit River Watershed Management Plan lists sediment, nutrients, and high flow as the major non-point source pollutants of the watershed. Are there others that should be included? *Spraying done on muck fields in the upper part of the river, I believe these are the primary problems, land-use planning also needs to be addressed,*

rotting logs, brush and leaves, tires, appliances, manure and cattle access, pesticides and chemicals, pathogens and bacteria.

6. Similarly, the Rabbit River Watershed Management Plan lists agriculture, construction, roadside erosion, and stormwater run-off as the major sources of non-point source pollution. What additional sources should be included? *Land use, zoning, road crossings, water quality, zoning ordinances, protecting prime farmland, restricting development in floodplains, discharge from trailer park, septic, road salt, activity by road commission and drain commission*

7. A general watershed inventory was conducted in fall and spring of 2001 to determine nonpoint source problems, and potential sites for Best Management Practices. Are there specific places for additional inventory or investigation, or sites that would benefit from Best Management Practices? (The Rabbit River Watershed Project is a totally VOLUNTARY project.) *Sediment Trap, junkyard in Hopkins Township, farmyard and feedlot in floodplain of Miller Creek, lots of places need attention*

8. Other General Comments: *Concern about effects of drain cleaning north of Wayland and increased amounts of water downstream, signs for installed BMPs*

9. Does everyone live in a watershed? **YES(14)** **NO(1)**

Meeting Information:

10. Was the meeting time convenient for you? **YES** **NO**

If not, what time(s) would fit your schedule? _____

Contact Information (OPTIONAL):

Name: _____

Preferred contact method (phone, mail, e-mail): _____

Contact Information: _____

Appendix 4a: Designated Uses Worksheet

A watershed management plan requires the steering committee to decide what the desired uses are for the watershed. (For example: recreational trails, protecting riparian buffers, protecting agricultural land, land-use planning, etc.) The State of Michigan also has certain designated uses. Please indicate on the form what uses of the watershed you think are active, important or desired, and whether that use is impaired (is currently poor) or threatened (likely to be poor in the future.)

Designated Uses	Desired or Active Use?	Impaired? (Is currently poor)	Threatened? (Likely to be poor)
(Example) Recreation— canoeing	Desired: I think we should be able to canoe	Yes—unable to canoe river because of obstructions	

All surface waters of the State of Michigan are designated and protected for the following uses:

1. Agriculture
2. Industrial water supply
3. Public water supply at the point of intake
4. Navigation
5. Warmwater fishery (some also protected as a coldwater fishery)
6. Other indigenous aquatic life and wildlife
7. Partial body contact recreation
8. Total body contact recreation between May 1 and October 31

Appendix 4b: Critical Areas:

Critical areas are the geographic portions of the watershed that are contributing a majority of non-point source pollutants and are having significant effects on the water body. Critical areas are the places to target or focus the project. They will be the places that are inventoried in detail, and the places where a majority of BMPs can be implemented.

Examples of critical areas for other projects are areas adjacent to the river or tributaries, areas with highly erodible land, areas with certain land-uses (i.e. industrial, high density residential, agricultural.)

Critical areas might contain entire sub-watersheds or tributaries, or might just be sections or small parts.

PROBLEMS AND CONCERNS FOR THE RABBIT RIVER WATERSHED	SOURCES OR CAUSES	TARGET AREAS OF THE WATERSHED (CRITICAL AREAS)



APPENDIX 4C: WATERSHED MANAGEMENT PLAN WORKSHEET

Please keep these things in mind as we list ideas and suggestions together:

1. Usability: What will make more people use this document? How can it be helpful? What information would we like to be available to decision-makers and local organizations?
2. Accuracy: Should be an accurate reflection of the steering committee and community's decisions.
3. While improving water quality is the focus, the plan can include other issues as well, such as air quality, aesthetics, etc.

Watershed Management Plan Outline, first draft

I. Introduction and Background:

- A. Natural Resources, and Physical (example: soils, floodplains, vegetation, maps,
- B. Sociopolitical Information (example: land-use, census information, settlement and development trends, attitudes (survey), etc.)

II. Existing Watershed Condition and Issues

- A. Pollutants, goals, Critical Areas (examples: goals and objectives, designated uses, known pollutants and sources, where to concentrate implementation)

- III. Systems of BMPs (example: focus on particular BMPs?)

- IV. Land-use planning (examples: Township coordination, planning, ordinance review and development, historical preservation, Farmland and open space preservation, rural character, aesthetics, greenways, recreation)

- V. Information and Education Plan: (examples: surveys, Student Stream Science Program, school visits, Portable Library Display, others?)

- VI. Existing water quality efforts, projects, data sources, and resources (examples: other projects, bibliographies, studies, etc.)

- VII. Conclusions (what conclusions do we want to draw, what is the “take-home message”?)

Appendix 5: Best Management Practices

Best Management Practices: Solutions that make sense



Field Erosion and Run-off

A BMP is described as any structural, vegetative, or managerial practice used to treat, prevent or reduce water pollution. BMPs are applied collectively to reduce or prevent the detachment, transport and delivery of sediment, nutrients, and other pollutants from the watershed into the water resources. In addition to improving water quality, BMPs are also designed to sustain producer profitability and maximize the conservation aspect of farming.

- **Grassed Waterway** – A natural or constructed channel that is shaped or graded to required dimensions and established with suitable vegetation for the stable conveyance of runoff. It is designed to accommodate concentrated flows without erosion and deliver runoff to a stable outlet, such as a Sediment, Erosion, or Water Control Structure.
- **Filter Strips** – Vegetative areas of perennial grasses and/or legumes adjacent to a stream, ditch, lake, or wetland. Filter strips remove sediment, organic matter, nutrients, and other pollutants from shallow runoff water called sheet flow. Removal is by filtration, infiltration, absorption, adsorption, decomposition, and volatilization.

- **Crop Residue Management** – This system uses plant residue to protect cropland during critical periods of erosion. The

plant residue is either the dead mulch left from the previous crop or a live cover crop that has been suppressed. Residue cover intercepts raindrops and serves as an umbrella to dissipate the energy of rain as it strikes the soil surface as well as provide protection from wind erosion. Residue cover also keeps soil cooler and moister. This practice reduces the amount of trips across the field with machinery, which is an economic benefit to the landowner. Tillage is the principle manipulator of residue. Tillage methods included in crop residue management include: No-till, mulch-till, strip till (zone till), and ridge till. Cover crops are also included in crop residue management.

- **Grade Stabilization Structure** – A structure used to control the grade and control erosion in natural or artificial channels. These structures prevent the formation or advance of gullies, and enhance environmental quality and reduce pollution hazards.
- **Waste Management Systems (Nutrient Management and Waste Utilization)** – A planned system in which all necessary components are present for managing liquid and solid waste (including runoff from concentrated waste areas) in a manner that does not degrade soil, water, plant, or animal resources. Managing the amount, form, placement and timing of applications of nutrients on cropland will provide . This standard applies to management of plant nutrients associated with organic waste, commercial fertilizer, and crop residue. The purpose is to supply plant nutrients for optimum forage and crop yields, minimize entry of nutrients to surface and groundwater, and to maintain or improve chemical and biological condition of the soil. Waste Utilization uses agricultural wastes on land in an environmentally acceptable manner while maintaining or improving soil and plant resources. Soil testing and developing a manure management plan are very important components of Waste Utilization.
- **Exclusion Fencing** – A constructed livestock barrier to prevent access to streambanks and surface water.

- **Stream Crossings** – A constructed stable area extending either into or across streams or other shallow water bodies. This practice is used to minimize sediment and nutrient delivery where livestock need access to streams or other shallow water bodies for watering and/or crossing. This practice is also used where a vehicle crossing of shallow water bodies is needed.
- **Detention and Retention Basins** – Wet detention basins maintain a permanent pool of water which is completely or partially displaced by received stormwater. Detention basins provide control of peak discharges for large storms, reduce flooding and stream bank erosion, and will improve the stability of a stream system. Detention and retention basins are also effective at removing sediment and nutrients by a settling process, but may also significantly warm the water in the permanent pool, and therefore may not be appropriate if the receiving stream is sensitive to increases in temperature.
- **Riparian Buffers** – An area of trees and other vegetation located in areas adjacent to surface water. Riparian buffers are designed to intercept surface runoff, wastewater, subsurface flow and deeper groundwater flows from upland sources for the purpose of removing or buffering the effects of associated nutrients, sediment, organic matter, pesticides or other pollutants prior to entry into surface waters and groundwater recharge areas. Riparian buffers also provide important habitat areas, and shading for streams and rivers.
- **Wetland Restoration** – A rehabilitation of a drained or degraded wetland where the soils, hydrology, vegetative community, and biological habitat are returned as close to natural conditions as possible.
- **Streambank Stabilization** – A practice used to arrest the accelerated erosion often associated with unvegetated banks and elevated discharge, and to reduce erosion. The initial bank protection may be provided primarily with vegetation, wood, and rock as necessary. In some instances the use of hard structures may be necessary to ensure permanent stream stability.



Field Erosion in Hopkins Township, 18th St.

Filter strips, grassed waterways, livestock access, and critical site treatments (such as streambank restoration, grade stabilization, riparian buffers, etc.) are the needed Best Management Practices most frequently observed, and the

most critical to reducing non-point source pollution. Filter strips, grassed waterways, and grade stabilization structures were easy to identify during the course of the inventory because evidence of erosion suggested a need for these BMPs. Crop residue management is more difficult to quantify, due the timing of the inventory, which was before and during the planting season. Many fields that were not plowed at the time they were inventoried may have been plowed afterwards. Nutrient management/waste utilization is also difficult to inventory, unless firsthand observations are made of the landowner applying animal waste or of heavy residue on a field, or resultant run-off. Throughout the inventory, flooding, as well as tremendous increases in flow in the drains and tributaries was observed during rain events. Some of the BMPs previously described in this report are practices that will address these hydrology problems within the watershed. These practices include but are not limited to wetland restoration, detention/retention basins, and riparian buffers. Streambank stabilization and restoration is needed in some areas.



Rabbit River, Wayland Township: Lawn to edge with little or no vegetative buffer.

Appendix 6: Spring Newsletter 2002

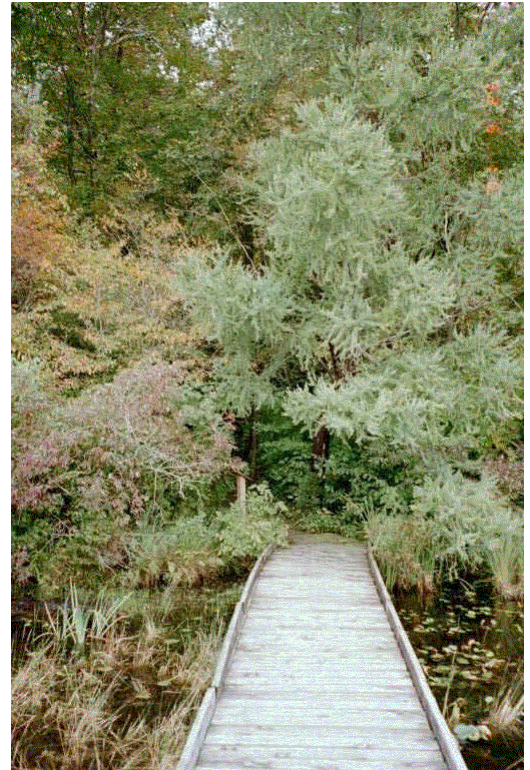
Dear Student Stream Science Participants,

Greetings! I hope that you are all looking beyond our recent return to wintry weather, and are (eagerly) looking forward to sampling this spring. The Rabbit River Watershed Student Stream Science Program has really taken off this year, and has received favorable attention from local news and media, and recognition from county and other local governments. This is all due to your participation, educators and students! I look forward to another great spring sampling season, and a chance to get some hands-on science opportunities.

Faculty participants in the Student Stream Science Program receive instruction and training before fieldwork. This year, we are proud to be able to offer two different training and workshop options. The first, a joint effort between the Rabbit River Watershed and Ebersole Environmental Education Center, is a Spring Stream Workshop on Saturday, March 16, 2002. This will be a free workshop, open to the public, and geared to a very general audience. We will discuss water quality, macroinvertebrates and identification, and have a chance to sample at the inlet and outlet of beautiful Jackson Lake. Our second training opportunity will be a Teacher Training Workshop on Wednesday, March 27, 2002, at the Allegan Match & Science Center. The Wednesday workshop will be more teacher-oriented, and will include discussion on curricula and incorporating benchmarks, and may have additional resources available. Both workshops are free of cost, and will have lunch provided. (We will ask for a donation to cover lunch costs at the Ebersole Workshop.)

Flyers are enclosed for each of the workshops, including agendas, and additional contact information. We encourage you to register early, and we look forward to seeing you there!

Sincerely,
Michelle Huffman, Watershed
Coordinator



Ebersole Environmental Education Center



Field visits will take place under the guidance of and with help from the watershed coordinator.

Bear Swamp Drain at Hopkins Village Park, Allegan Workforce Initiative Program

Background and History

Since the summer of 2000, over a hundred students from six different school districts have participated in hands-on stream science activities as part of the Student Stream Science Program, a collaboration of the Allegan County Math and Science Center and the Allegan Conservation District's Rabbit River Watershed Project. The Student Stream Science program allows teachers and students to evaluate the water quality in the Rabbit River Watershed by collecting macroinvertebrate samples and recording stream characteristics at specific sites throughout the watershed.

Monitoring takes place at each site twice a year, spring and fall, and will establish a water quality database to analyze long-term watershed trends.



Students sample and identify macroinvertebrates. Numbers and types are recorded to quantify stream condition and water quality.

Wayland New Directions Program, Red Run Drain at North Dorr Park

Students use nets and screens to collect aquatic insects, mollusks and other invertebrates, which are then identified and recorded. Other relevant observations such as land-use, stream substrate, erosion, and vegetation are also noted. The results are sent to the Allegan Conservation District, and to the Michigan Department of Environmental Quality for further study. Educators from six area schools have participated in training programs, as well as local residents, and others interested, with many more to attend the upcoming spring training. As of fall of 2001, eight different school programs have participated, and have sampled at 7 different sites.

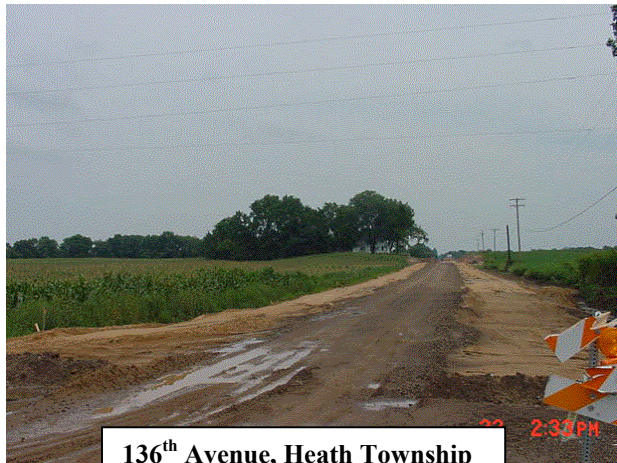
Participating Groups:	Sites Sampled to Date:
Wayland High School SET Program	Silver Creek
Wayland New Directions	Red Run/Little Rabbit
Pearl School (Fennville Schools)	Miller Creek (Salem Township)
Hopkins High School	Miller Creek (Hopkins Township)
Martin High School	Rabbit River
Allegan Math and Science Center	
Plainwell Schools	Brooks Drain (Leighton Township)
Allegan WIA Summer Program	Bear Creek, Silver Creek

The Rabbit River Watershed Project is a voluntary, community-driven watershed project to identify the problems, needs, and water quality solutions of the watershed. The watershed is located in southwestern Lower Michigan, in Allegan County.

Appendix 7: Roadside Erosion

Roads and Non-point Source Pollution: Preventing Problems and Seeking Solutions

Roadside erosion, road-stream crossings, and road ditch clean-outs are a substantial source of sediment delivery to surface water in the Rabbit River Watershed. In addition to being a major source of sediment itself, dirt and gravel roads may have specific pollutants such as oil, gas, road treatment (dust treatment) chemicals and road salt, all of which may all be associated with roadside sediment. Sediment and pollutants are carried into nearby streams and ponds. Dirt and gravel roads, because of their nature and design (if not properly managed) can contribute substantially to nonpoint source pollution.



136th Avenue, Heath Township

In the Rabbit River Watershed, certain areas are more likely to have hills, and steeper topography. These slopes must frequently be traversed by roads, and are very susceptible to increased roadside erosion.

Road-stream crossings, because of the design and need for bridges and/or culverts to be higher than high water mark, frequently have short steep slopes that may be subject to erosion. Because of the nearness of the surface water, this type of erosion is especially harmful.

Roadside erosion is accelerated by removal of vegetation, disturbance such as construction, or by heavy, prolonged use.

Some pollutants associated with road run-off and erosion are oil and gas. Petrochemicals such as these in large quantities are toxic to many aquatic wildlife, such as fish and aquatic macro-invertebrates. Preventing erosion, and channeling road run-off to appropriate locations will prevent these nonpoint source pollutions from reaching surface water.



Bacterial slime on surface water due to run-off



Gravel road through wetland area

Roads in Allegan County most often run in straight lines: north and south, east and west. Occasionally, this means that roads will cut through sensitive areas such as wetlands. In

many cases, this was for financial reasons, as the shortest distances between two points is a straight line. Unfortunately, due to the low position in the general landscape of wetlands, constructing a road through a wetland effectively channels road run-off and associated pollutants directly to the wetland.

In some cases, if a wetland is attached to surface water, this will cause further pollutants to be delivered downstream.

Also, delivering sediment to a wetland will decrease it's floodwater storage capacity, thus increasing flooding to the surrounding areas, and most frequently, the road itself.

Road Maintenance

Road grading, while it is a very necessary thing, can contribute large amounts of sediment to surface water. Gravel roads with culverts are immediately adjacent to surface water. Road grading, by its very nature, moves a lot of gravel, dirt, and other road material around to adjust road surfaces. Loosening this road material makes roads very susceptible to erosion, both in the road surface, and on the banks.



Road Grading, Wayland Township



Roadside ditch scraping and cleanout: No mulching or planting.

Another aspect of road maintenance that contributes significantly to nonpoint source pollution is roadside ditch cleanouts. While maintaining adequate roadside ditches is critical for good road drainage, to maintain the accessibility, safety, and travelability for roads, good drainage will also prevent road washouts, and erosion of the edges of roads. However, using machinery to scrape out sediment from ditches also removes vegetation, and exposes the ground to run-off. Use of mulching or netting, and seeding to replace vegetation can prevent or alleviate erosion associated with this practice. Cleaning out roadside ditches without the used of such practices will cause large amounts of sediment to be delivered to surface water.



Roadside erosion: road bank washout (drains to surface water)

Gravel roads with inadequate drainage and/or steep sides may have erosion problems. The most effective way to prevent such erosion is to have good site planning: where to direct surface water and run-off to prevent erosion and protect water quality. (Great Lakes Better Backroads, 1998)

BMPs: Solutions for water quality

Many BMPs exist that can reduce the amount of sediment that reaches the surface water. For example, silt fencing, mulch netting and seeding.



Miller Creek, Before (Summer, 2001)

Miller Creek, a quality coldwater stream flows through Monterey, Salem and Overisel townships, crossing several roads, shortly before it enters the Rabbit River, it flows under 136th Ave, a gravel road with lots of traffic. The Allegan County Road Commission performed construction on the road, including replacing the culvert through which Miller Creek flows. Small twin culverts with large flat bottom culvert were replaced, allowing for a more natural stream flow. Correct alignment of the culvert with stream flow. Armoring of any banks deemed to be subject to erosion. Liberal and correct use of silt fences to prevent run-off and sediment from reaching stream. Use of straw mulch netting and reseeded. This road project was extensive, and was perhaps influenced by the Rabbit River Watershed project's information dispersal of the quality of the stream.

Results of the construction: due to a five –inch rain (100-year storm) one small section of the silt fence was breached, and some sediment reached the stream. However, much was averted, and future sediment will be averted thanks to re-seeding. Sediment that reached the stream will most likely be incorporated and will “heal itself” by next spring.



Miller Creek, After (Fall, 2001) Note some sediment deposit



Miller Creek at 136th and 36th St. Coldwater trout stream. Culvert replacement and road repair.

Repaired culvert and installed drainage to channel run-off down through concrete tube directly to stream. This will alleviate any roadside bank erosion problems (which is good, since this is a very steep streambank) unfortunately, this directs run-off directly to the stream, with no opportunity for infiltration. As a side effect, also, agriculture and dirt driveway run-off from up hill also makes use of this channel, and runs directly to the stream.

The Rabbit River Watershed Project applauds the efforts of the Allegan County Road Commission on this project. We also recognize that there is still more we can all do to improve water quality. Ditch cleanouts along roads still take place with no reseeding and/or netting to prevent erosion. Erosion is still common.

Culverts (in some places) are still not aligned with stream flow. In some places, this is due to poor drain placement. The Rabbit River Watershed project will continue to work with the Road Commission to find the best, most efficient and cost-reasonable solutions for water quality.

Some of the tools we offer the road commission and other, private road owners are as follows: High quality coldwater trout streams in the Rabbit River and their proximity to roads, paved and gravel., Great Lakes Better Backroads Guidebook: Clean Water By Design, a publication of Huron Pines Resource Conservation and Development Area Council. The Watershed Project would encourage the road commission, or any one else interested in preventing road erosion and stream crossing erosion to pursue this idea. Preventing roadside erosion, and education programs targeting this issue are in line with the goals of this watershed project, and are encouraged to the fullest extent possible.



Miller Creek sediment past silt fence

Appendix 8: Livestock Access

Areas of unlimited livestock access to surface water contribute large amounts of sediment and nutrient inputs to the stream. Fencing livestock out of the stream has an often almost immediate effect on in stream habitat, macroinvertebrate populations and fish reproduction (Jay Wesley, MDNR Fisheries, personal communication). Unlimited livestock access to streams and surface water is covered under Michigan's Right-to farm laws, and is prohibited under the Generally Accepted Agricultural Management Practices, or GAAMPS. Landowners, producers or farmers who are in non-compliance with this guideline may have complaints brought against them, and thus be encouraged to install practices to fix the issues. The Rabbit River Watershed encourages landowners to participate in federal and state programs to solve this water quality problem. In the Rabbit River Watershed, many of the livestock controlled access sites that have been installed resulted from right-to farm complaints. In total, 23 Right-to-farm complaints have been brought against producers for having livestock in the stream.



Unlimited Cattle Access, small tributary to the Rabbit River

Livestock access in the Rabbit River Watershed occurs mainly in the smaller tributaries of the watershed. In a few notable exceptions, cows have unlimited access directly to the Rabbit River.

In some areas, cows or horses are fenced out of the stream, but the buffer zone between pasture and water is virtually non-existent. In these occasions, the producers are following the letter of the law, but not the spirit. Keeping the cows directly out of the stream reduces the amount of inputs, and corrects for sediment and erosion



Livestock Exclusion site with little or no buffer

problems, but still allows a significant amount of run-off to enter surface water. Especially in areas where livestock is pastured all along a stream in floodplain area, low relief of land allows nutrient rich sediment to wash into surface water. In areas like this, we salute producers for fencing livestock out of surface water, but would encourage them to install more of a buffer between pasture and surface water systems. In some cases, it would be an excellent use of funds to move fencing, and install a filter strip, or riparian buffer. Certain amounts of trees along a fence could also provide livestock with shade, and protection from wind and weather.

The water quality problems associated with unlimited livestock access can be solved by a simple system of Best Management Practices (BMPs). Armored stream crossings can still provide a path from one pasture to another, and alternate sources of water provide a cleaner, more controlled water source. Reinforced or heavy-use areas along animal trails and walkways will prevent sediment delivery, and keep animals from wallowing in mud. Several types of fencing have proved effective in this situation, and in many cases will provide additional safety for the pastured animals. If the creek or streambed has been denuded of vegetation, then planting and mulching is advised. In certain situations where the pasture slopes to the streambank, filter strips and buffers should be installed between the stream and the fence. In areas where

vegetation has not been severely impacted, some areas may repair themselves. Planting trees along the creek outside the fence area will provide shade for animals and the creek, and will prevent the livestock from over-browsing the trees.

Areas of the Rabbit River watershed that have livestock access include nearly all of the sub-watersheds, most notably Miller Creek and the Rabbit River in the Hopkins area. Green Lake Creek subwatershed, the Upper Rabbit River, and Bear Swamp Drain also have several unlimited livestock access sites. In the lower stretches of the Rabbit, the Black Creek sub-watershed has many unlimited livestock access sites. All of these areas would benefit from livestock exclusion practices.

In addition to cows, many horse pastures have unlimited access to surface water. The Rabbit River Watershed, because of the rural nature, and the rural residential aspect of Allegan County, has many horses, for farm use, pleasure riding, or other uses. Many of these horses are pastured, and may have surface water running through pasture. While a few horses with unlimited access may not have the same deleterious effects that many cows do, horses can cause serious erosion of the streambank. In a few specific locations in the Rabbit River Watershed, horses have created serious erosion and inputs to stream. Many landowners may not simply be aware of the problems associated with horses in streams and creeks, and some may even prefer it, thinking it “scenic” or special. In these cases, information and education may be very helpful towards solving this problem.



Livestock Unlimited Access Site: Donkeys, Horses, Miniature Horses, Goats, and a Mule

Suggested BMP Sites:

Leighton Sec. 30, Green Lake Stream: Horse pasture
Leighton Sec. 18, Gilbert/Wademan Drain: Cows and calves
Leighton Sec. 26, Brooks Drain: Horse pasture
Leighton Sec. 6, Johnson Drain: cows
Wayland Sec 9/16, McIntire Lake Drain: barn/feedlot run-off, access site.
Allegan Sec. 1, unnamed drain: horse pasture
Hopkins Sec. 25, Miller Creek: Cow pasture
Hopkins Sec. 12, lake, drain: cow pasture
Hopkins Sec. 28, Branch 1 Mankins drain: cow pasture
128th near Hopkins